Secondary Vertex Finding w/ RAVE

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Multi-vertex finding with Rave

- It's implemented in the Genfit module (done by Haiwang)
  - Put these in the G4_Svtx.C macro (or other silicon tracker macros)

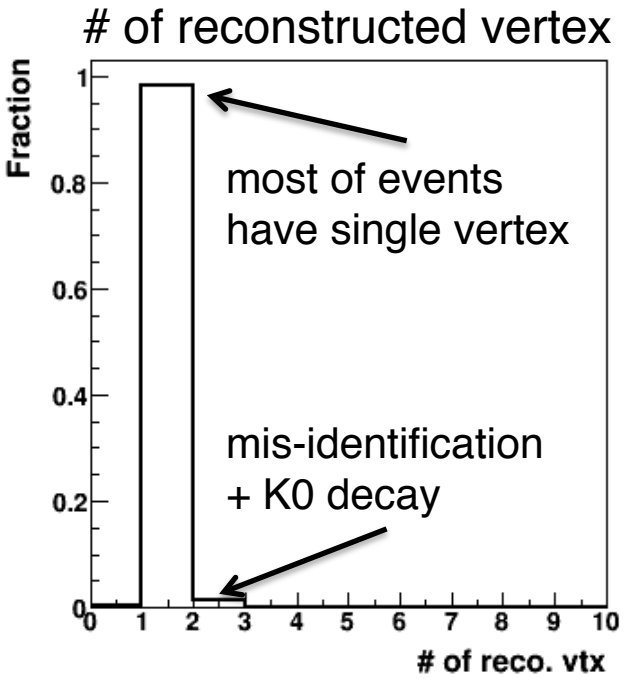
```
PHG4TrackKalmanFitter *kalman = new PHG4TrackKalmanFitter();
kalman->set_do_eval(true);
kalman->set_vertexing_method("tkf-smoothing:1");
se->registerSubsystem(kalman);
```

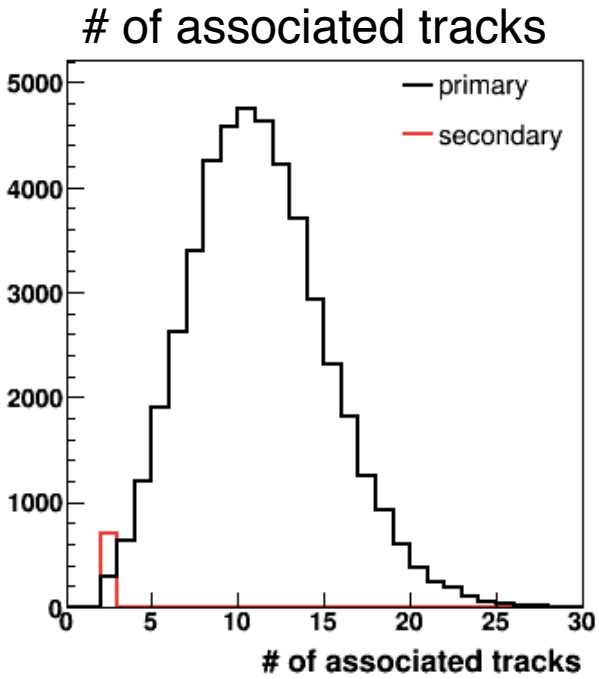
  - Multi-vertex option
    1) "tkf" : trimmed Kalman filter (remove tracks incompatible with the vertex)
    2) "avr" : adaptive filter (use weight function)
    →checking initial parameters can be adjusted in the GFRave
    3) "mvf-ini:(finder:avr)" : simultaneous fit with 'n' seeds
    →checking a certain track is used in multiple vertices with different weights

  - "SvtxVertexMapRefit" node will be created

Multi-vertex test (TKF)

- udsg jets (PhaseSpace:pTHatMin = 25 GeV), 7 layers MAPS
  - put all reconstructed tracks into the vertex finder, generated (0,0,0) will test tracks within a certain area (jet cone)





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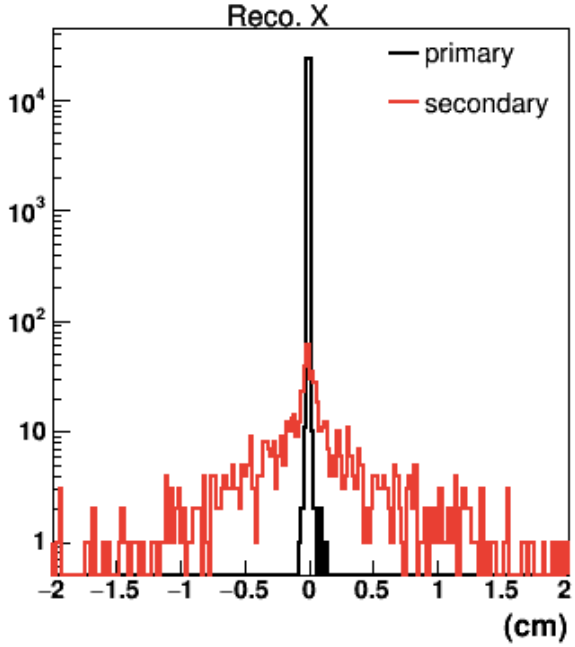
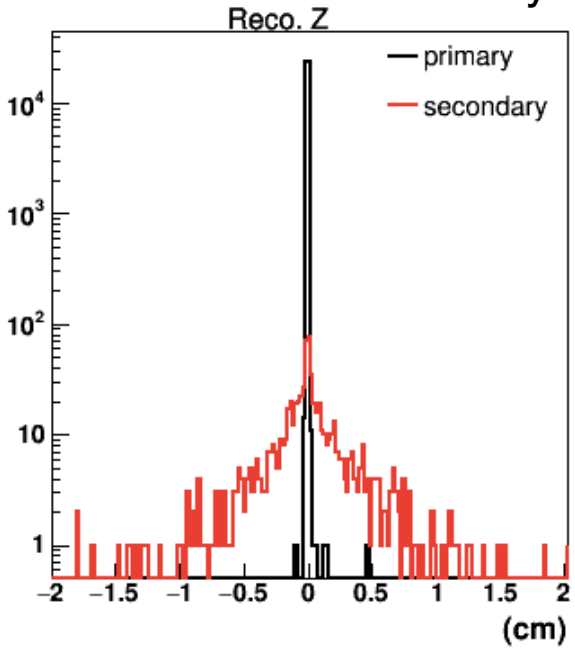
Reconstructed vertex x

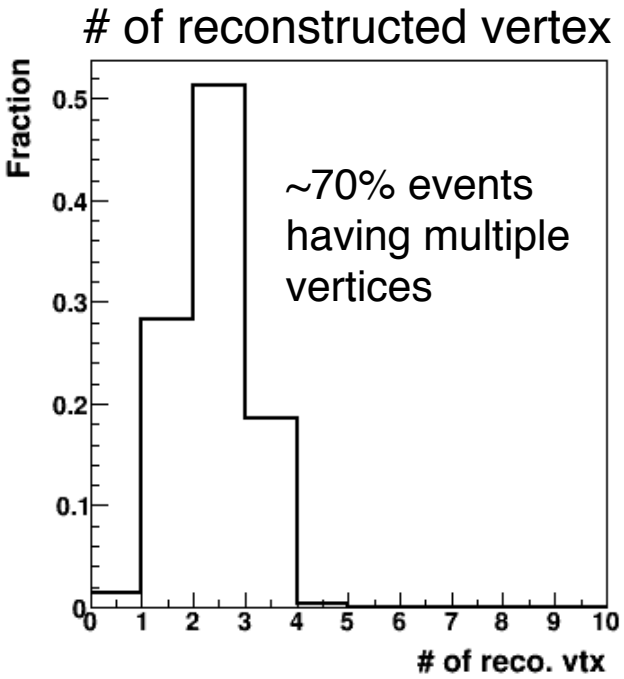


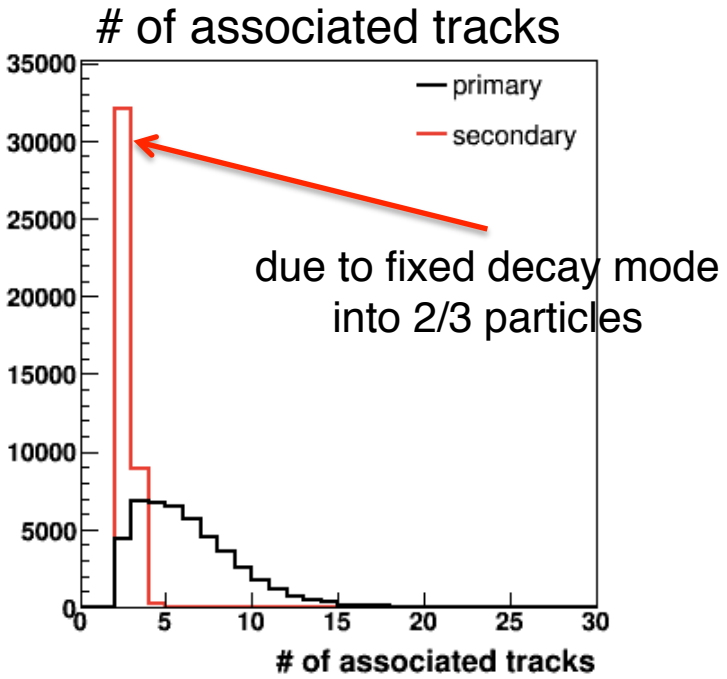
Reconstructed vertex y



Multi-vertex test (TKF)

- Testing with simple case (fixed decay mode with HardQCD:bbbar)
  - put all reconstructed tracks into the vertex finder, generated (0,0,0)





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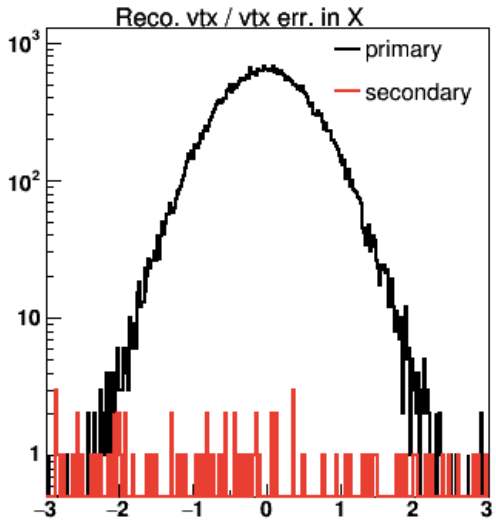
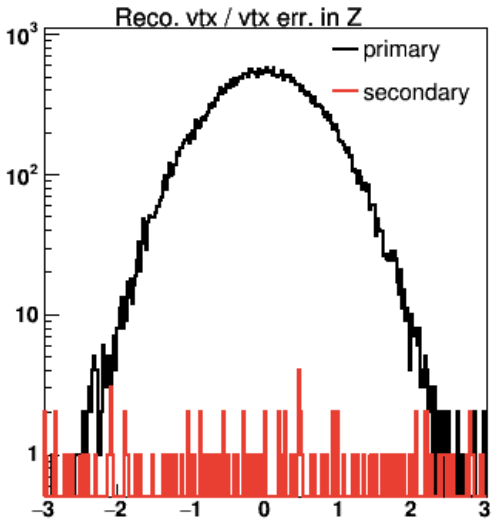
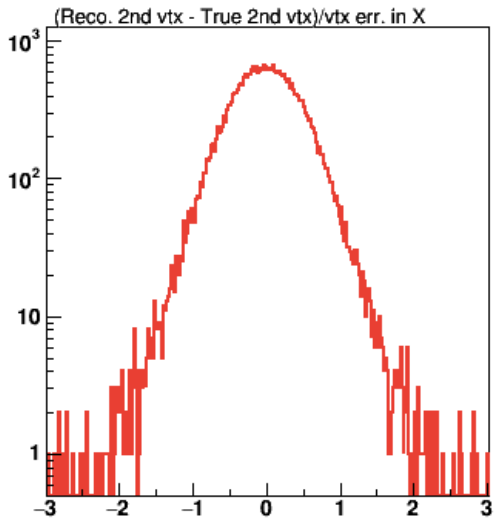
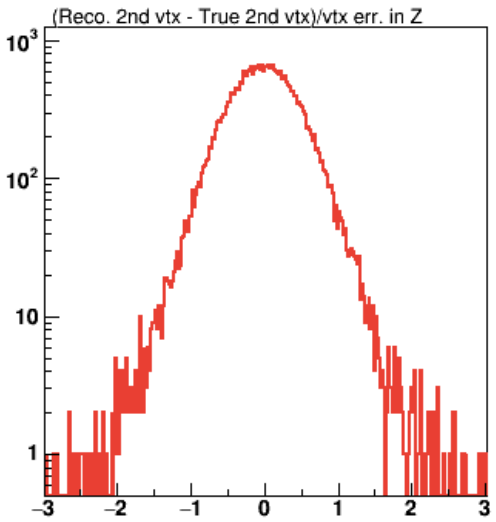
Reco vtx / vtx err primary vtx from udsg





Reco vtx / vtx err secondary vtx from b





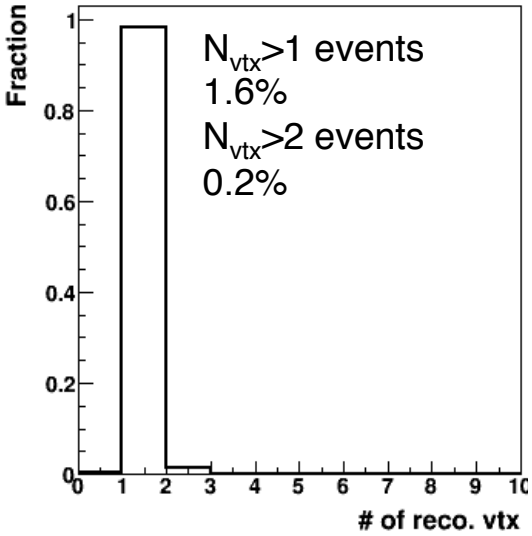
associated tracks in ~87% of secondary vertices from 1 mother particle (source)

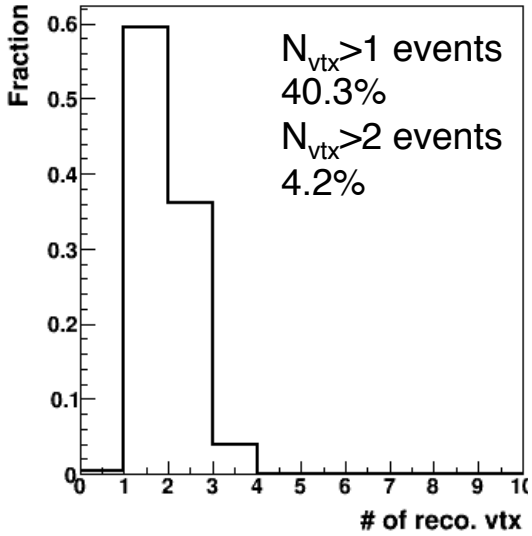
Multi-vertex test (TKF)

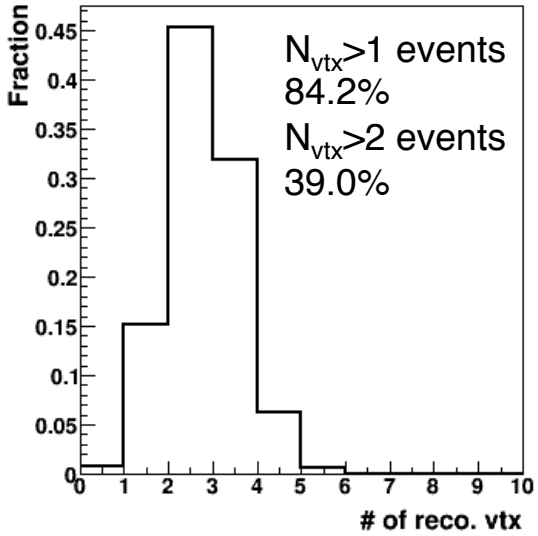
- Comparison between udsg / c / b (~5k events for each)

udsg | c | b

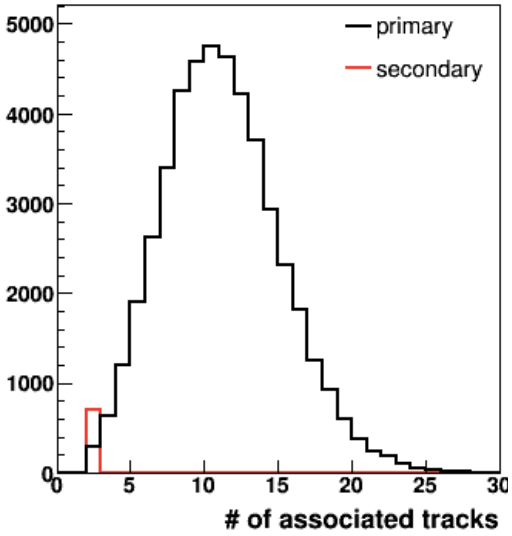
# of reco. vtx

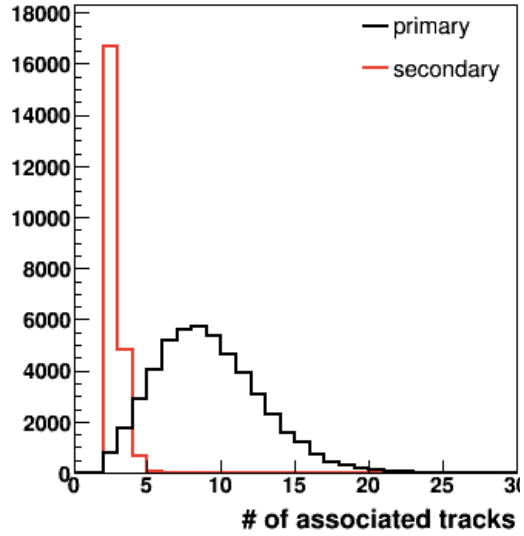


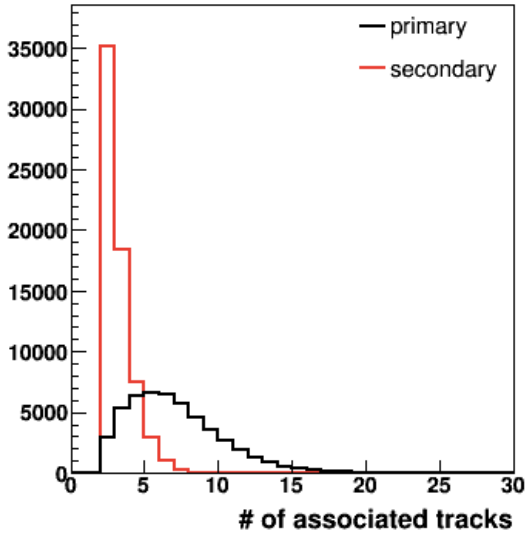




# of asso. tracks







Next…

- Rave in sPHENIX software
  - checking interfaces in GFRave for setting parameters

- Performance check
  - vertex finding with tracks in a jet
  - comparison between three methods
  - secondary vertex mass?